Evaluation of salivary cortisol as a biomarker for plasma cortisol during ACTH challenge and at variable salivary consistency

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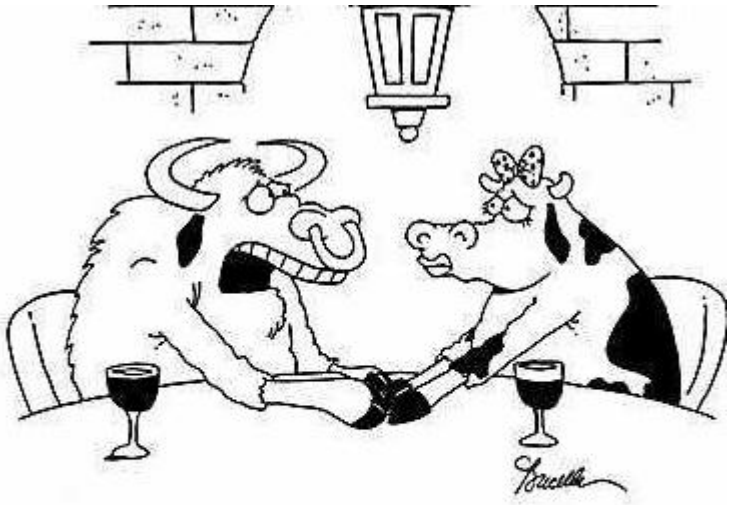
Introduction

- Modern and sustainable dairy farming implies the consideration and improvement of animal welfare.
- Non-invasive sampling is crucial for unbiased results
- The implementation of feasible biomarkers must be robust to various physiological and environmental conditions.



"It has nothing to do with you, Bessie. It's just that I'm lactose intolerant."

Objectives

- **Validate suitability of cortisol measurement in saliva at different levels of blood cortisol concentration**
- **Effects of variable saliva consistency and composition on its cortisol concentration**

Material & Methods

Two experiments

- **Experiment 1**

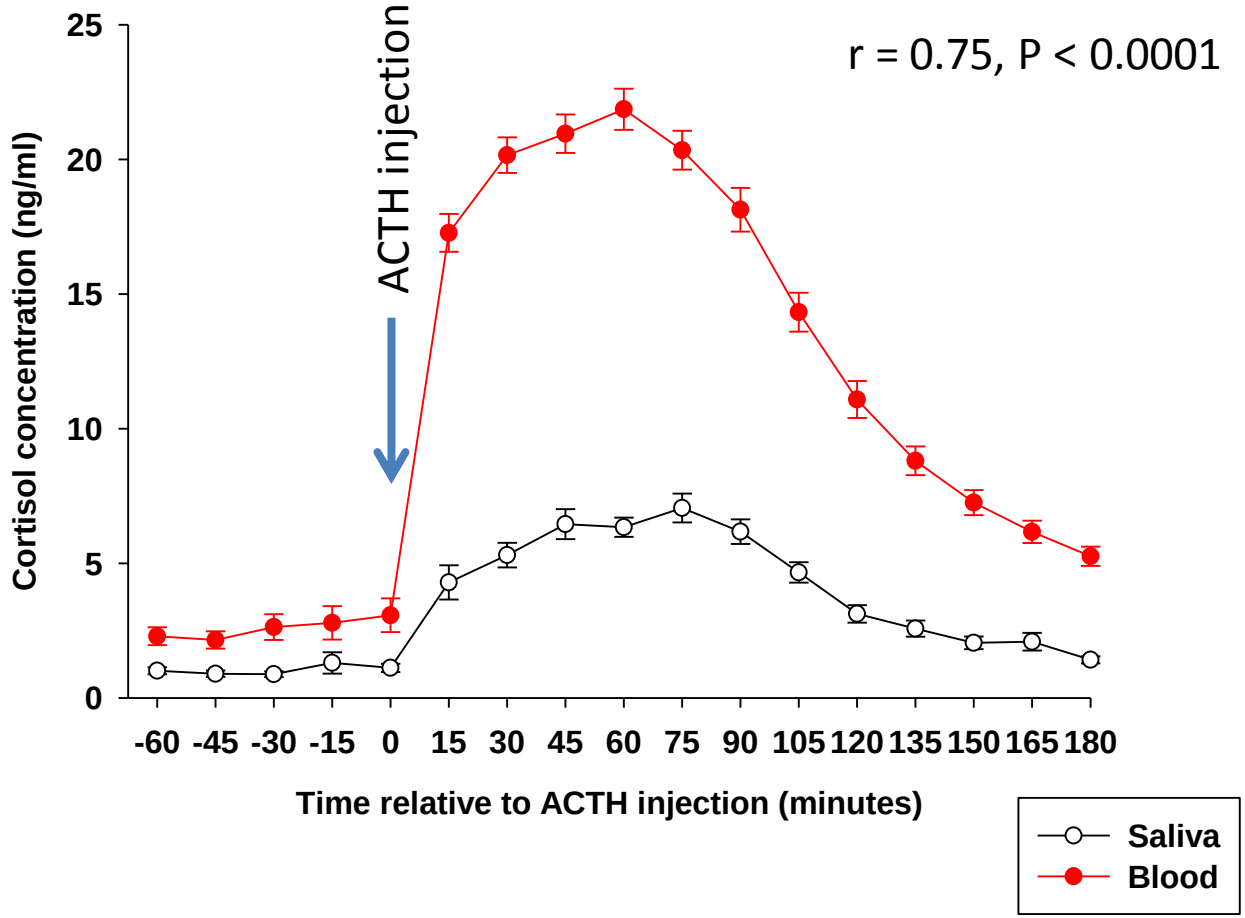
- 23 Holstein dairy cows
- Week 3 postpartum
- ACTH i.v. (16 µg/100 kg BW)
- Sampling every 15 min for 4 h
- Color measurement in saliva (RGB)

- **Experiment 2**

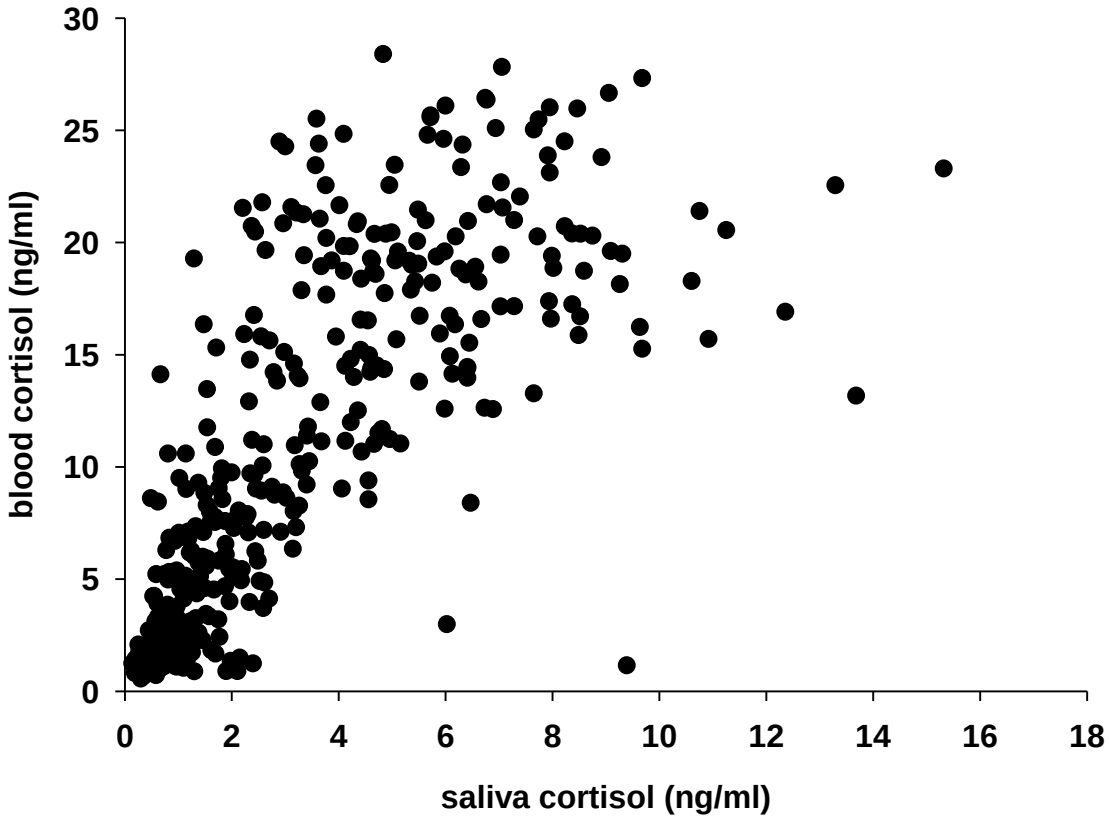
- One cow
- Sampling before, during, and after (5’ and 15’) drinking, ruminating, and feeding

- Each saliva sample was taken immediately after the respective blood sample
- Cortisol in saliva was measured by EIA (Salimetrics) and in blood by RIA.

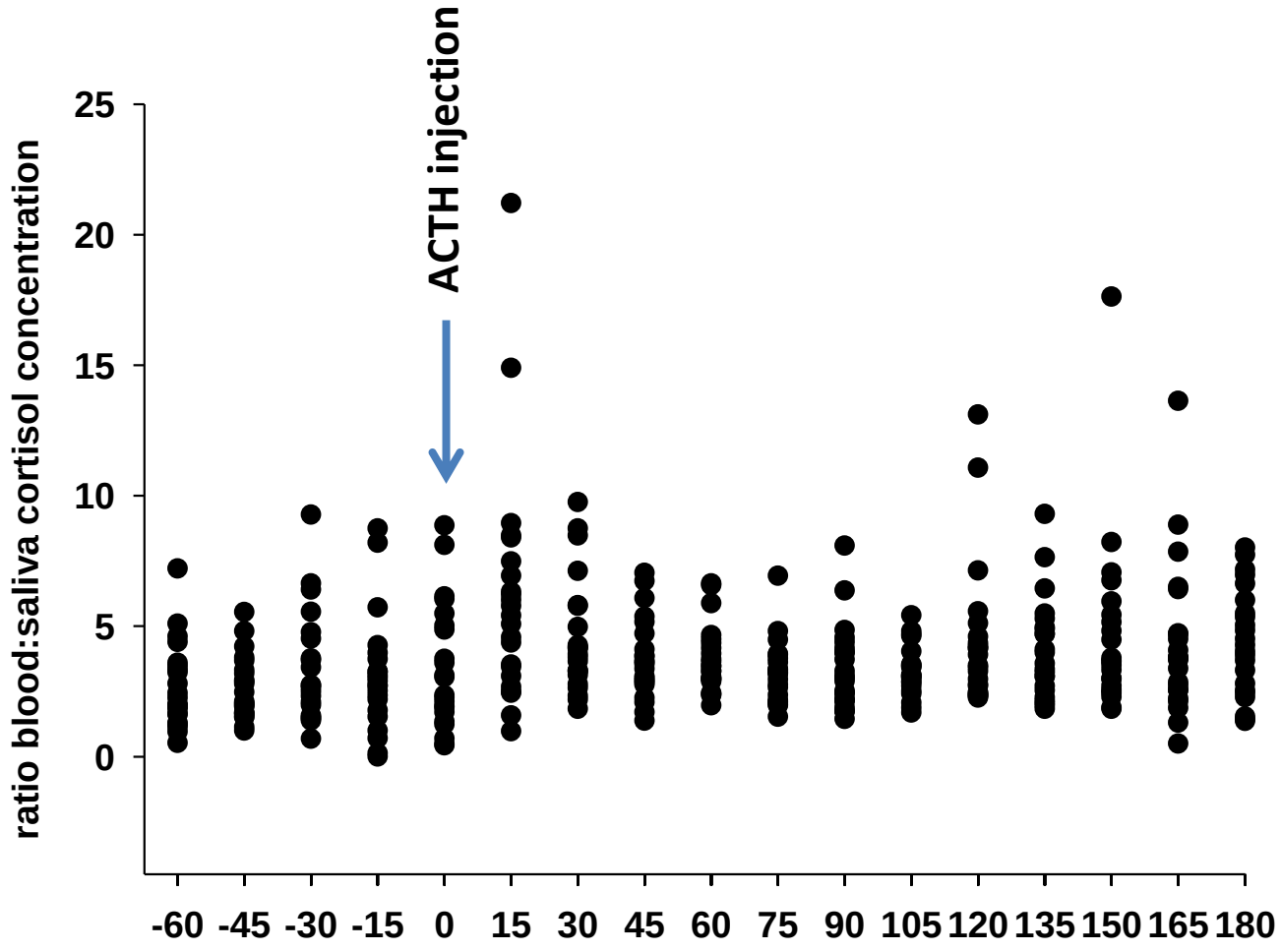
Results – Experiment 1 ACTH-Challenge



Results – Exp. 1
Blood vs. saliva cortisol

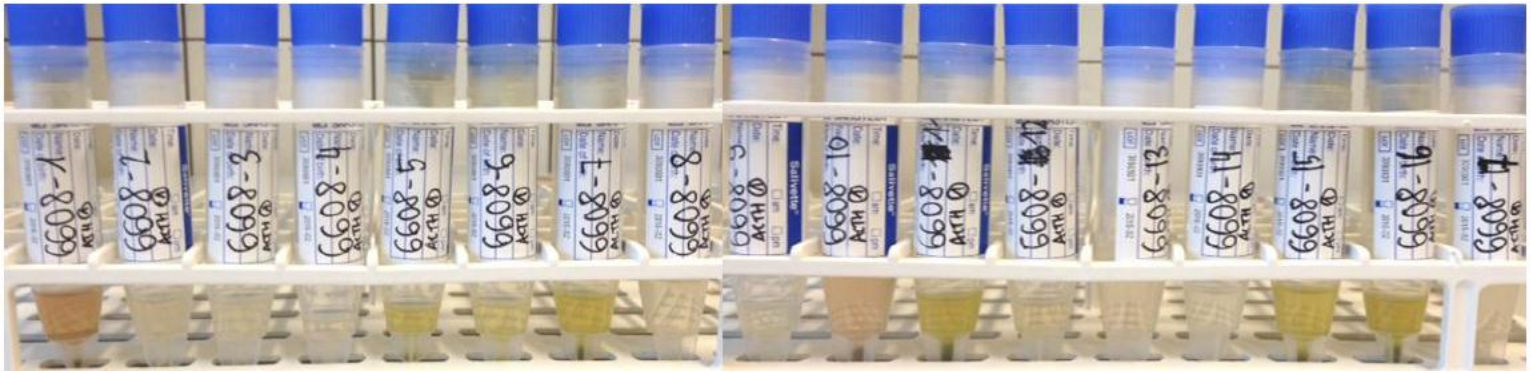


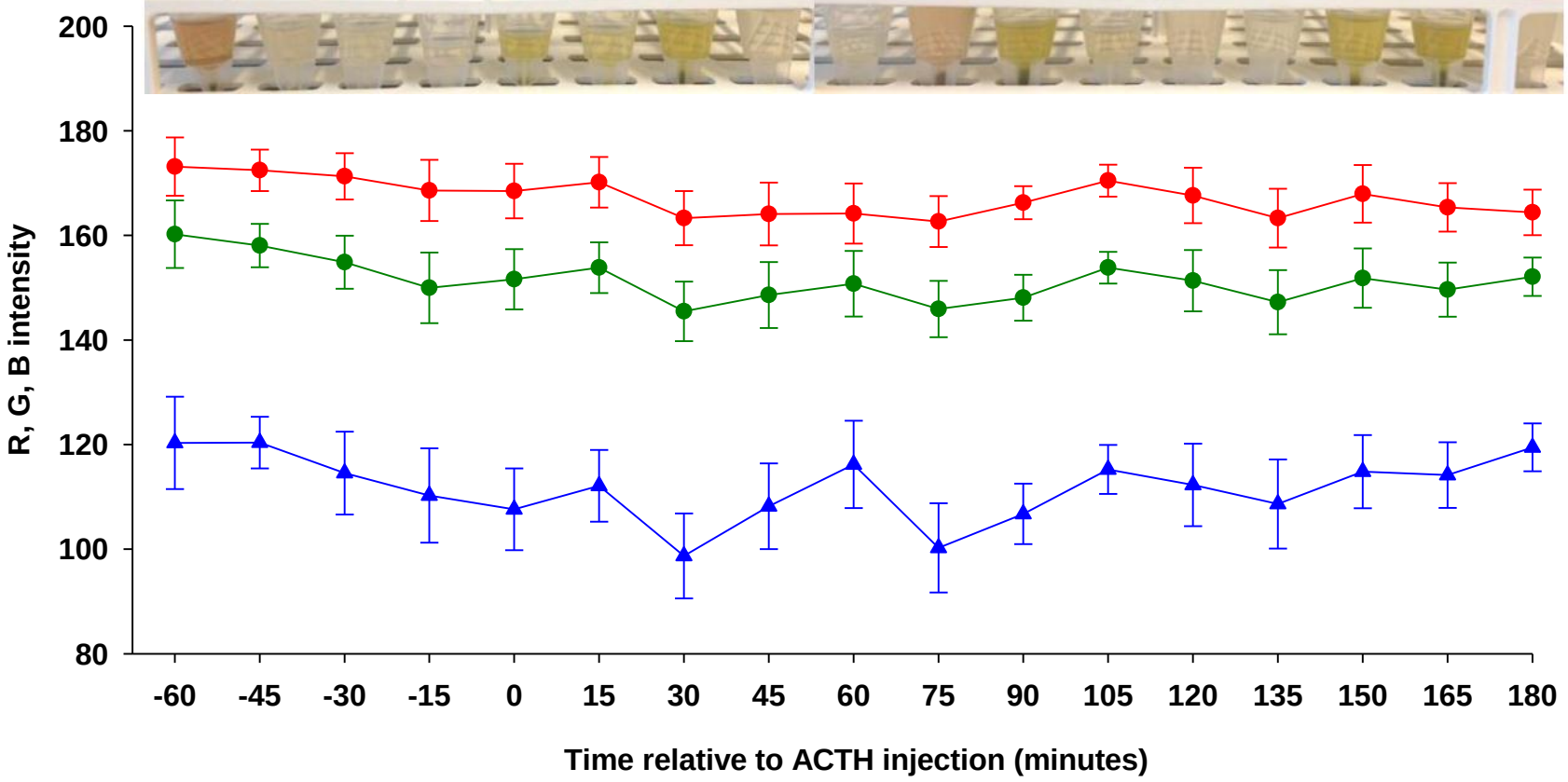
Results – Exp. 1
Blood : saliva cortisol-ratio



Results – Exp. 1

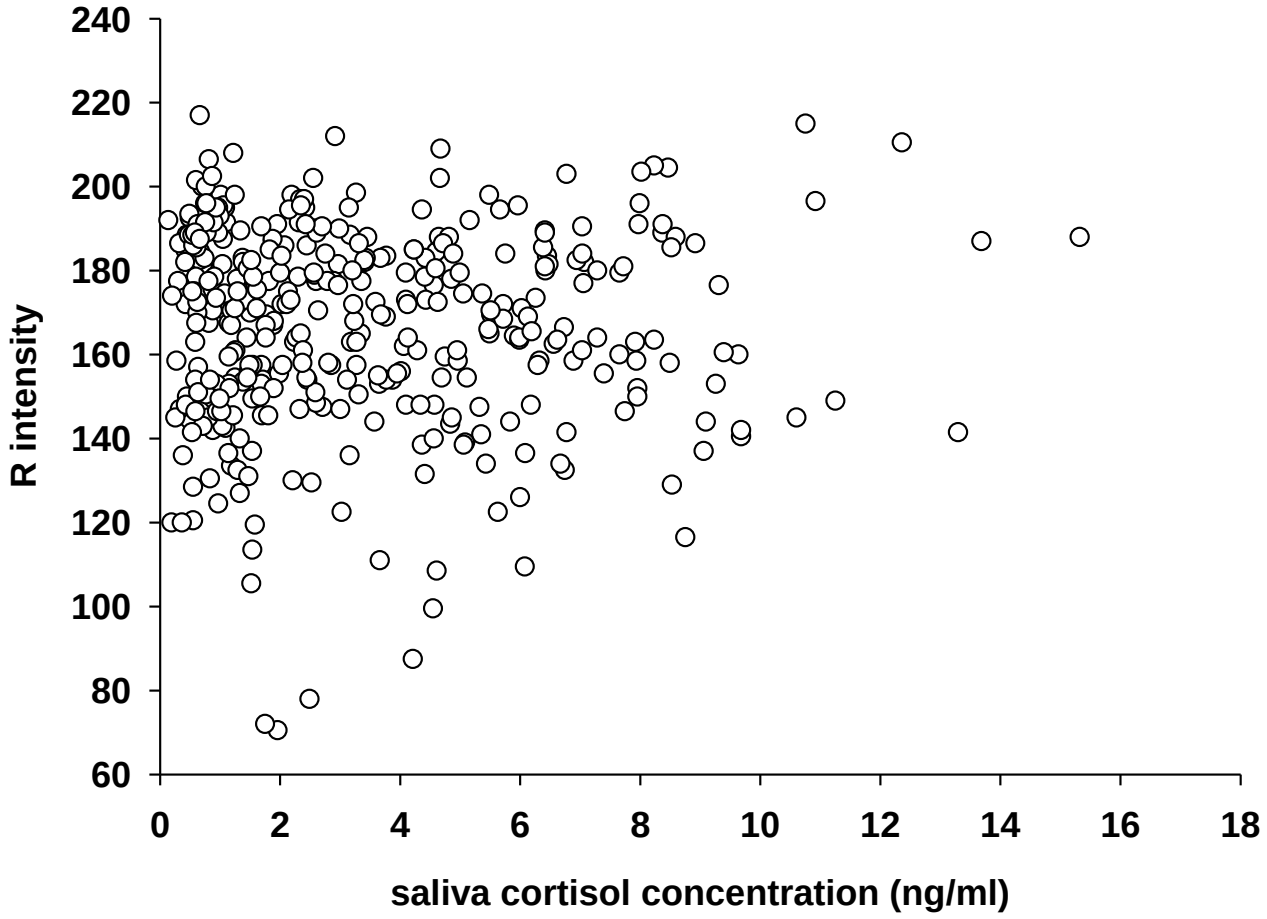
Variation in saliva color and consistency





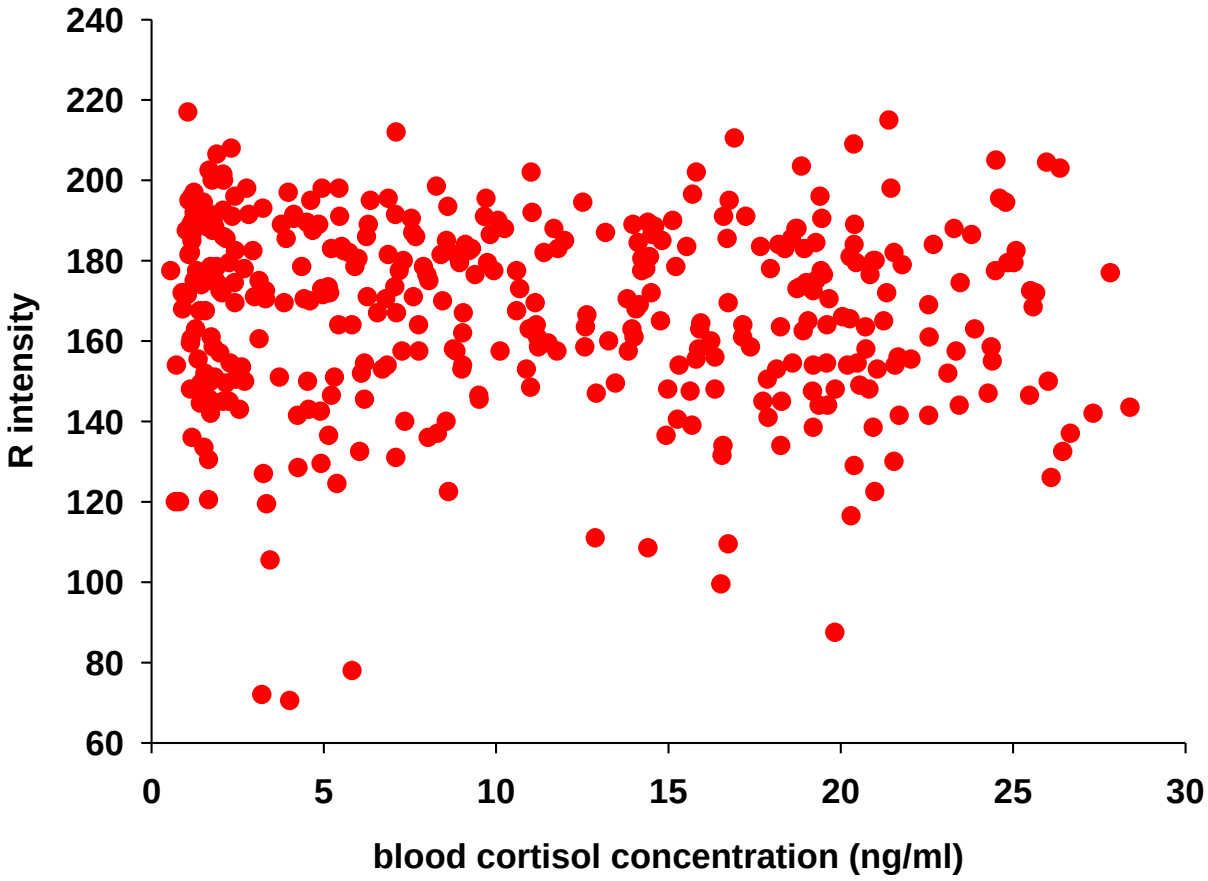
Results – Exp. 1

Relation between saliva cortisol and redness color in saliva



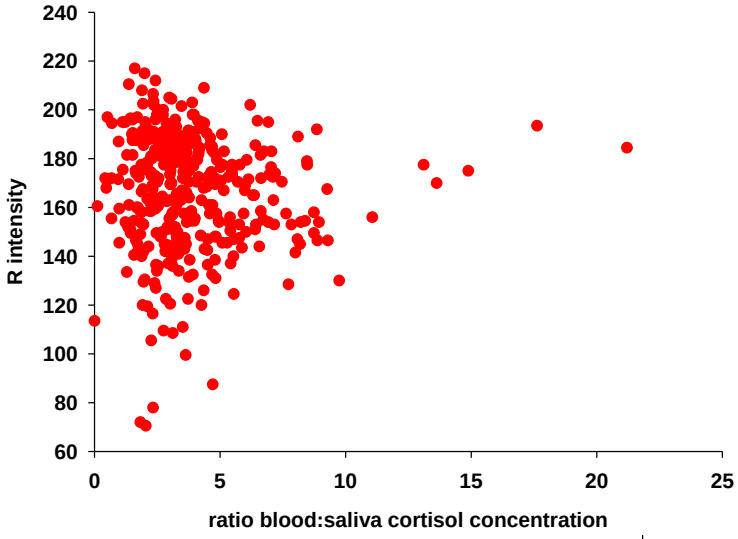
Results – Exp. 1

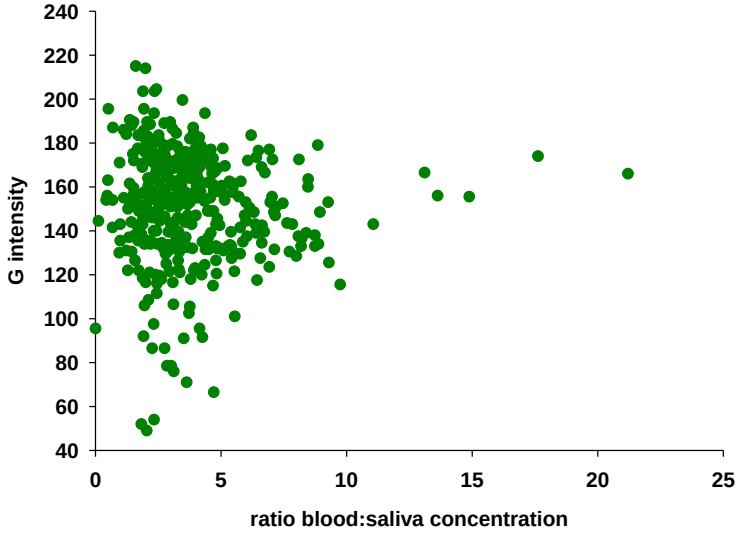
Relation between blood cortisol and redness color in saliva

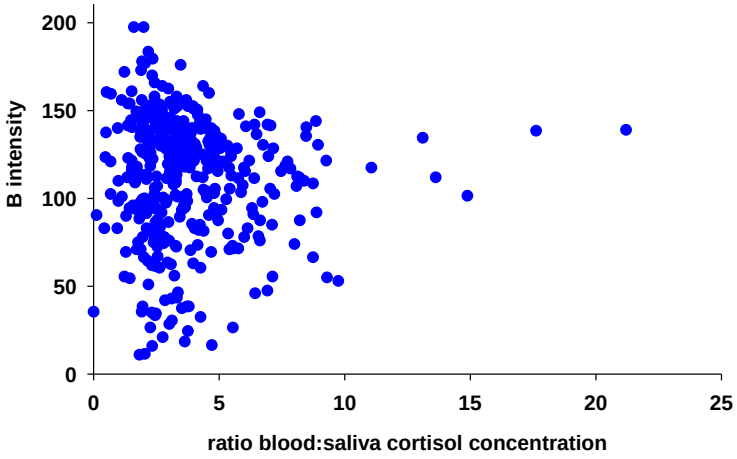


Results – Exp. 1

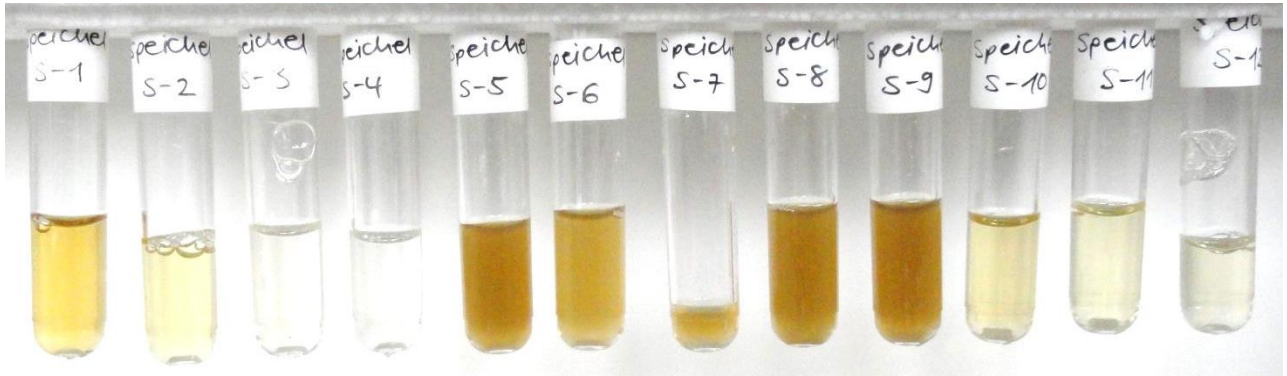
Relation between blood : saliva cortisol ratio and RGB color priorities in saliva





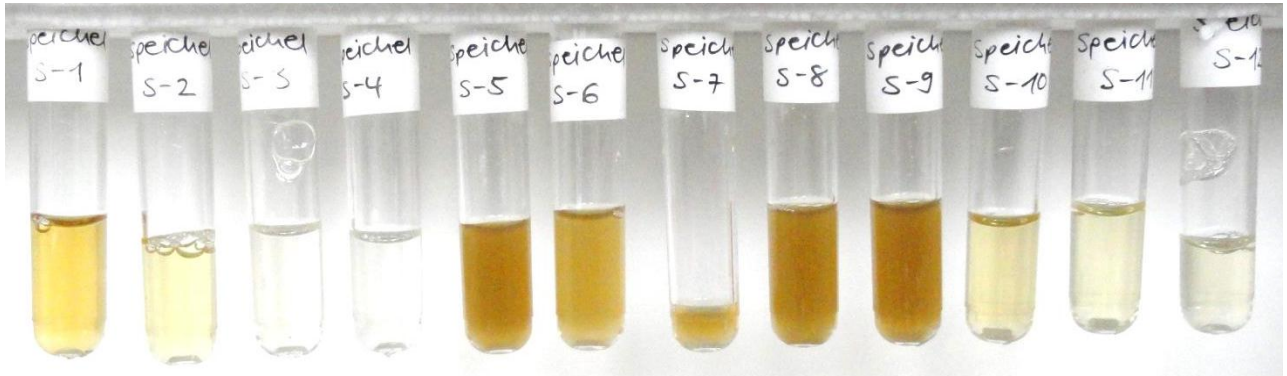


Results – Experiment 2



S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12
«basal»		drinking			ruminating				feeding		
0’	+15’	0’	+5’	+15’	=	0’	+5’	+15’	=	+5’	+15’

Results – Experiment 2



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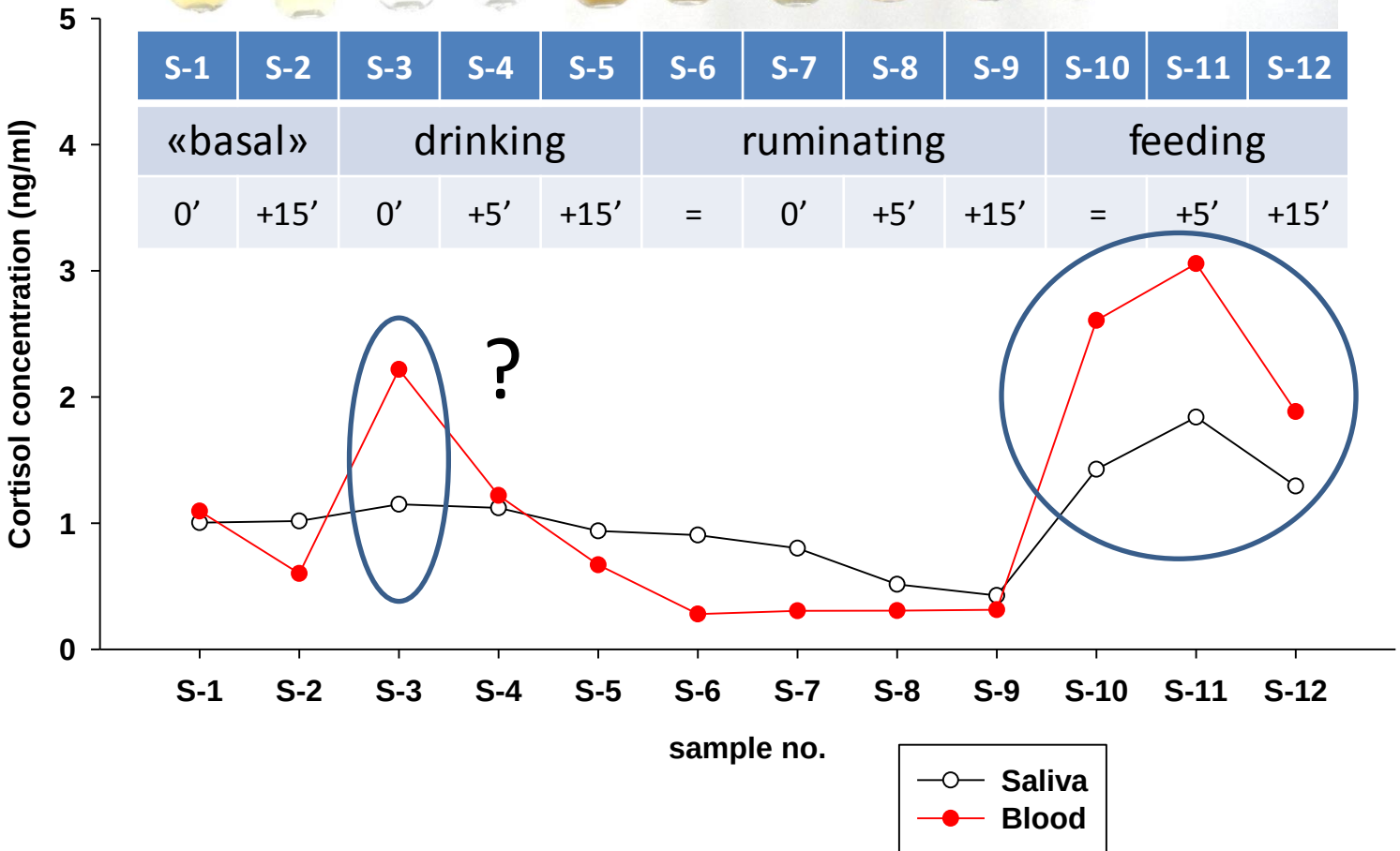

Conclusions

- Results emphasize the power of saliva cortisol mirroring plasma cortisol for non-invasive stress estimation.

- Saliva can be confirmed an ideal non-invasive substrate for robust cortisol determination in dairy cows, independent of physiological status and consistency of saliva.

Thank you for your attention!

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